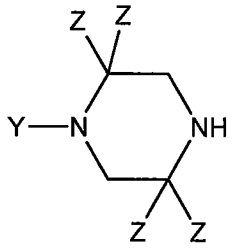
## I. AMENDMENT

PLEASE ENTER THE FOLLOWING AMENDMENT WITHOUT PREJUDICE OR DISCLAIMER. Applicants reserve the right to file a divisional or continuation application to the originally filed claims. Text deleted from the original appears in ~~strikethrough~~ and text to be added to the original has been underlined. The following listing of claims will replace all prior listings and versions of the claims in this application.

1. (Currently Amended) An isotopically enriched N-substituted piperazine compound of the formula:




, or a salt thereof~~, comprising one or more heavy atom isotopes,~~ wherein;

Y is a straight chain or branched C1-C6 alkyl group or a straight chain or branched C1-C6 alkyl ether group wherein the carbon atoms of the alkyl group or alkyl ether group are each independently ~~comprise~~ optionally substituted with ~~linked hydrogen,~~ deuterium or fluorine atoms; and

each Z is independently hydrogen, fluorine, chlorine, bromine, iodine, an amino acid side chain, a straight chain or branched C1-C6 alkyl group that may optionally contain a substituted or unsubstituted aryl group wherein the carbon atoms of the alkyl and aryl groups are each independently ~~comprise~~ optionally substituted with ~~linked hydrogen or~~ fluorine atoms, a straight chain or branched C1-C6 alkyl ether group that may optionally contain a substituted or unsubstituted aryl group wherein the carbon atoms of the alkyl and aryl groups are each independently ~~comprise~~ optionally substituted with ~~linked hydrogen or~~ fluorine atoms or a straight chain or branched C1-C6 alkoxy group that may optionally contain a substituted or unsubstituted aryl group wherein the carbon atoms of the ~~alkyl~~ alkoxy and aryl groups are each independently ~~comprise~~ optionally substituted with ~~linked hydrogen or~~ fluorine atoms;

wherein the N-substituted piperazine is isotopically enriched with one or more $^{13}C$ atoms and/or $^{15}N$ atoms.

2. (Currently Amended) The compound of claim 1, wherein the N-substituted piperazine is isotopically enriched with two or more ~~heavy atom isotopes~~ atoms of $^{13}C$ and/or $^{15}N$.

3. (Currently Amended) The compound of claim 1, wherein the N-substituted piperazine is isotopically enriched with three or more ~~heavy atom isotopes~~ atoms of $^{13}C$ and/or $^{15}N$.

4. (Currently Amended) The compound of claim 1, wherein the N-substituted piperazine is isotopically enriched with four or more ~~heavy atom isotopes~~ atoms of $^{13}C$ and/or $^{15}N$.

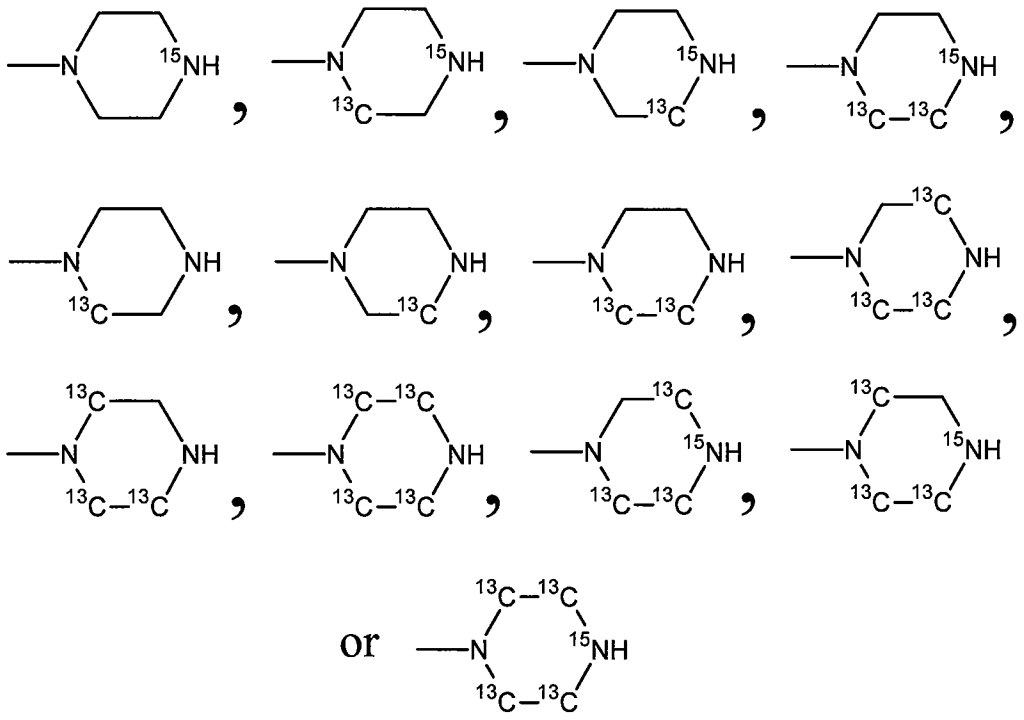
5. (Original) The compound of claim 1, wherein each Z is independently hydrogen, fluorine, chlorine, bromine or iodine.

6. (Original) The compound of claim 1, wherein each Z is independently hydrogen, methyl or methoxy.

7. (Original) The compound of claim 1, wherein Y is methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, isobutyl, *sec*-butyl or *tert*-butyl.

8. (Original) The compound of claim 1, wherein each nitrogen atom of the piperazine ring is independently $^{14}N$ or $^{15}N$.

9. (Previously Presented) The compound of claim 1 of the formula:



or a salt of any of the foregoing.

10. (Original) The compound of claim 9, wherein the compound is a mono-TFA salt, a mono-HCl salt, a bis-TFA salt or a bis-HCl salt.

11. (Original) The compound of claim 9, wherein each incorporated heavy atom isotope is present in at least 80 percent isotopic purity.

12. (Original) The compound of claim 9, wherein each incorporated heavy atom isotope is present in at least 93 percent isotopic purity.

13. (Original) The compound of claim 9, wherein each incorporated heavy atom isotope is present in at least 96 percent isotopic purity.

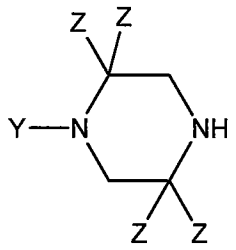
14. (Original) The compound of claim 1, wherein the N-substituted piperazine is a mono-TFA salt, a mono-HCl salt, a bis-HCl salt or a bis-TFA salt.

15. (Original) The compound of claim 1, wherein each incorporated heavy atom isotope is present in at least 80 percent isotopic purity.

16. (Original) The compound of claim 1, wherein each incorporated heavy atom isotope is present in at least 93 percent isotopic purity.

17. (Original) The compound of claim 1, wherein each incorporated heavy atom isotope is present in at least 96 percent isotopic purity.

18. (Currently Amended) An isotopically enriched N-substituted piperazine compound of the formula:




, or a salt thereof~~, comprising one or more heavy atom isotopes,~~ wherein;

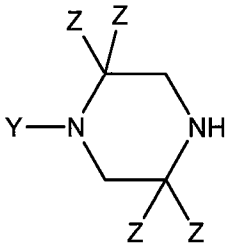
Y is a straight chain or branched C1-C6 alkyl group or a straight chain or branched C1-C6 alkyl ether group wherein the carbon atoms of the alkyl group or alkyl ether group are each independently ~~comprise~~ optionally substituted with ~~linked hydrogen,~~ deuterium or fluorine atoms; and

each Z is independently hydrogen, fluorine, chlorine, bromine, iodine, an amino acid side chain~~,~~ or a straight chain or branched C1-C6 alkyl group that may optionally contain a substituted or unsubstituted aryl group wherein the carbon atoms of the alkyl and aryl groups are each independently ~~comprise~~ optionally substituted with ~~linked hydrogen or~~ fluorine atoms;

wherein the N-substituted piperazine is isotopically enriched with one or more $^{13}C$ atoms and/or $^{15}N$ atoms.

19. (Previously Presented) The compound of claim 18, wherein each Z is hydrogen.

20. (Currently Amended) An isotopically enriched N-substituted piperazine compound of the formula:



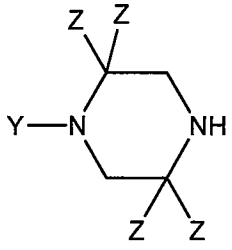
, or a salt thereof, wherein;

Y is a straight chain or branched C1-C6 alkyl group or a straight chain or branched C1-C6 alkyl ether group wherein the carbon atoms of the alkyl group or alkyl ether group are each independently ~~comprise~~ optionally substituted with ~~linked hydrogen,~~ deuterium or fluorine atoms; and

each Z is independently hydrogen, fluorine, chlorine, bromine, iodine, an amino acid side chain~~,~~ or a straight chain or branched C1-C6 alkyl group that may optionally contain a substituted or unsubstituted aryl group wherein the carbon atoms of the alkyl and aryl groups are each independently ~~comprise~~ optionally substituted with ~~linked hydrogen or~~ fluorine atoms; and

wherein the N-substituted piperazine is isotopically enriched with one or more ~~heavy atom isotopes,~~ $^{13}C$ atoms and/or $^{15}N$ atoms.

21. (New) An isotopically enriched N-substituted piperazine compound of the formula:



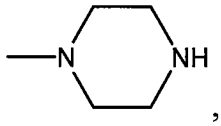
, or a salt thereof, wherein;

Y is a straight chain or branched C1-C6 alkyl group or a straight chain or branched C1-C6 alkyl ether group; and

each Z is independently hydrogen, fluorine, chlorine, bromine, iodine, an amino acid side chain, a straight chain or branched C1-C6 alkyl group, a straight chain or branched C1-C6 alkyl ether group or a straight chain or branched C1-C6 alkoxy group; and

wherein the N-substituted piperazine is isotopically enriched with one or more $^{13}C$ atoms and/or $^{15}N$ atoms.

22. (New) An isotopically enriched N-substituted piperazine compound of the formula:




,

or a salt thereof, wherein the N-substituted piperazine is isotopically enriched with one or more $^{13}C$ atoms and/or $^{15}N$ atoms.